



**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

IN RE APPLICATION OF: JASON L. FULLER AND  
SHAUN D. COMPTON

APPLICATION NO.: 10/081,624

FILED: FEBRUARY 20, 2002

FOR: **MICROELECTRONIC DEVICE HAVING A  
PLURALITY OF STACKED DIES AND  
METHODS FOR MANUFACTURING  
SUCH MICROELECTRONIC  
ASSEMBLIES**

EXAMINER: JOHN T. HARAN

ART UNIT: 1733

CONF. No: 1950

**Declaration of Jason L. Fuller and Shaun D. Compton**  
**Under 37 C.F.R. § 1.131**

Mail Stop AF  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

We, Jason L. Fuller and Shaun D. Compton, declare and state that:

1. We are the joint inventors of the invention described and claimed in U.S. Patent Application No. 10/081,624 (the "present application") filed February 20, 2002. This declaration establishes invention in this country before April 10, 2001, and thus before the issue date of U.S. Patent No. 6,212,767.

2. Before April 10, 2001, we conceived the invention claimed in the present application. Our conception of the invention is corroborated by (a) the signed and redacted pages of Micron Technology, Inc. Invention Disclosure Form 01-0427 (hereinafter, the "01-0427 Disclosure," attached to this declaration as Exhibit A), and (b)

a signed and redacted page of Jason Fuller's Lab Book (hereinafter, the "Lab Book," attached to this declaration as Exhibit B).

3. As shown in the 01-0427 Disclosure and the Lab Book, we conceived of a method for assembling microelectronic dies. (See Exhibit A, pp. 1-2; and Exhibit B.)

4. In one embodiment set forth in claim 1, a method for assembling microelectronic dies includes placing a base die on a substrate in a first die attach head of a die attach machine so that a front side of the base die with bond pads faces toward the substrate and a backside of the base die faces away from the substrate. (See Exhibit A, page 1; and Exhibit B.) The method further includes stacking a first stacked die onto the backside of the base die in a second head of the same die attach machine by dispensing an adhesive onto the backside of the base die and placing a backside of the first stacked die onto the adhesive. (See Exhibit A, page 1; and Exhibit B.) Therefore, the first stacked die is stacked onto the base die before securing the base die to the substrate in a heating cycle. (See Exhibit A, page 1; and Exhibit B.)

5. We also conceived of another embodiment, as set forth in claim 2, wherein the method for assembling microelectronic dies further includes heating the based die and the first stacked die in a single heating cycle to secure the base die to the substrate and to secure the first stacked die to the base die. (See Exhibit A, pp. 1-2; and Exhibit B.)

6. We also conceived of another embodiment, as set forth in claim 7, wherein the method for assembling microelectronic dies further includes automatically transferring the substrate and the base die from the first die attach head to the second die attach head. (See Exhibit A, pp. 1-2.)

7. We also conceived of another embodiment, as set forth in claim 8, wherein the method for assembling microelectronic dies further includes transferring the substrate and the base die from the first die attach head to the second die attach head

without loading the substrate and the base die into a separate die attach machine. (See Exhibit A, pp. 1-2.)

8. We also conceived of another embodiment, as set forth in claim 9, wherein the method for assembling microelectronic dies further includes placing the base die on the substrate and stacking the first stacked die onto the base die in a single pass through a single die attach machine. (See Exhibit A, pp. 1-2.)

9. In yet another embodiment set forth in claim 10, a method for assembling microelectronic dies includes preparing a substrate to receive a base die in a first die attach head of a die attach machine, and placing the base die on the substrate in the first die attach head so that a front side of the base die with bond pads faces toward the substrate and a backside of the base die faces away from the substrate. (See Exhibit A, page 1; and Exhibit B.) The method further includes moving the base die to a second die attach head of the same die attach machine without heating the base die, and stacking a first stacked die onto the base die in the second die attach head by dispensing an adhesive onto the backside of the base die and placing the first stacked die onto the adhesive in the second die attach head. (See Exhibit A, page 1; and Exhibit B.)

10. We also conceived of another embodiment, as set forth in claim 11, wherein the method for assembling microelectronic dies further includes heating the base die and the first stacked die in a single heating cycle to secure the base die to the substrate and to secure the first stacked die to the base die. (See Exhibit A, pp. 1-2; and Exhibit B.)

11. After conceiving this invention, we proceeded diligently by preparing the 01-0427 Disclosure with our employer, working through a initial invention review procedure, participating in patent preparation activities with Paul Parker, and participating in other aspects of preparing the present patent application. On February 20, 2002, we constructively reduced this invention to practice with the filing of the present application.

12. We further declare that all statements herein made of our own knowledge are true, and that statements made on information or belief are believed to be true; and further, that the statements are made with the knowledge that the making of willful or false statements or the like is punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code, and may jeopardize the validity of any patent issuing from this patent application.

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Jason L. Fuller

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Date

Residence : City of Meridian, County of Ada  
State of Idaho

Citizenship : United States of America

P.O. Address : 1287 E. Drucker Street  
Meridian, Idaho 83642



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Shaun D. Compton

8 Feb. 2005

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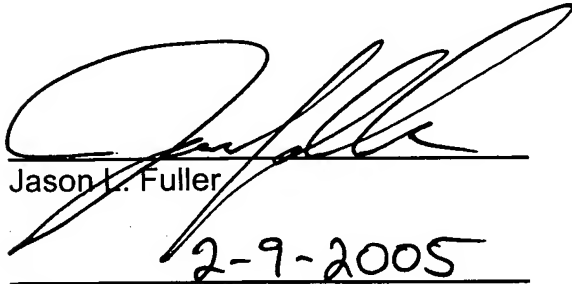
Date

Residence : City of Boise, County of Ada  
State of Idaho

Citizenship : United States of America

P.O. Address : 2950 Raindrop Drive  
Boise, Idaho 83706

12. We further declare that all statements herein made of our own knowledge are true, and that statements made on information or belief are believed to be true; and further, that the statements are made with the knowledge that the making of willful or false statements or the like is punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code, and may jeopardize the validity of any patent issuing from this patent application.

  
Jason L. Fuller  
2-9-2005

Date

Residence : City of Meridian, County of Ada  
State of Idaho  
Citizenship : United States of America  
P.O. Address : 2396 S. Ice Bear Court  
Meridian, Idaho 83642

\_\_\_\_\_  
Shaun D. Compton

\_\_\_\_\_  
Date

Residence : City of Boise, County of Ada  
State of Idaho  
Citizenship : United States of America  
P.O. Address : 2950 Raindrop Drive  
Boise, Idaho 83706

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**Exhibit A**

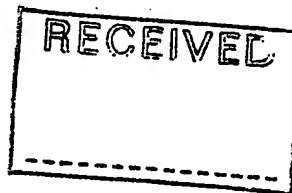


## INVENTION DISCLOSURE

01-0427

## INVENTOR(S):

Jason L Fuller  
Shaun D Compton



## 2. DESCRIPTION:

## • Title:

Method for processing a stacked FCIP (Flip Chip & Conventional in 1 pkg.)

## • Brief Description:

Method includes the following in order: (1)Placing a flip chip component on the substrate (2)Dispensing epoxy on the backside of the flip chip (3)Placing another die into the epoxy (face up) on the back side of the flip chip. This process will only require one pass through the die attach machine. The substrate then indexes into the oven for solder reflow and epoxy snap cure at the same time. Another method would include utilizing a heated bond head to reflow the flip chip during placement. The flip chip die would then be mechanically attached during dispensing and placing the conventional die.

## 3. CONCEPTION &amp; DOCUMENTATION OF INVENTION:

## • Date when first conceived:

## • To whom was the idea first described:

none

## • On what date:

## • Date of the first tangible record:

## • Type and location:

Logged concept into Inventors Notebook.

## 4. INFORMATION RELATED TO INVENTION:

## • Related invention disclosures:

I'm sure many stacked die disclosures exist, however, I don't know the details of any related to this concept. There is Micron internal documentation which depicts this titles "Conventional/FCIP Stack"

dated December  
as I know.

The method for processing is undefined as far

- Closest technology:

A two pass process where the flip chip is reflowed, and then ran through die attach a second time to apply the conventional (2nd) die.

- Advantages of this invention over previous technology:

This would only require one pass through a die attach machine which increases output and simplifies the process.

#### 5. IMPORTANT DATES:

- If the invention has been disclosed outside the company, please specify to whom it has been disclosed, when, and in what form:

No disclosures outside Micron

- If any articles describing your invention have been published, please specify the author(s), title of article, publication and date:

Don't know of such publications

- If any engineering samples have been given out, please specify to whom and on what date they were given:

N/A

- If any product using the invention has been sold or offered for sale, please specify to whom and on what date:

N/A

#### 6. DISPOSITION OF THE INVENTION:

- When will (or did) Micron begin use of the invention experimentally:

Experiments will begin the week of

- When will (or did) Micron begin production of this invention:

No production to date. Applications are on the roadmap for late

#### 7. MISCELLANEOUS INFORMATION:

- ARPA project:

- Was the invention developed during a joint development agreement or other contract with an outside company:

No



- List developmental work outside of the company, including Government proposal or contract:

N/A

8. INVENTORS:

• \_\_\_\_\_  
Name : Jason L Fuller  
Home Address : 1287 E. Drucker  
City : Meridian State : ID Zipcode : 83642  
Citizenship : USA  
Company : Micron Technology, Inc.  
Work Phone # : 368-2669 Mail Stop : 906  
Dept Name : Assembly Die Attach Dept # : 224  
Supervisor : Ed Schrock

Signature : \_\_\_\_\_

Date : \_\_\_\_\_

• \_\_\_\_\_  
Name : Shaun D Compton  
Home Address : 1651 S. Riverstone Lane #202  
City : Boise State : ID Zipcode : 83706  
Citizenship : US  
Company : Micron Technology, Inc.  
Work Phone # : 363-1999 Mail Stop : 906  
Dept Name : Assembly Dept # : 224  
Supervisor : Ed Schrock

Signature : \_\_\_\_\_

Date : \_\_\_\_\_

9. WITNESS:

If there is only one (1) inventor, a witness should sign and date this disclosure. A witness in this case is a non-inventor who understands the nature of the invention.

\_\_\_\_\_  
( Signature of Witness )

\_\_\_\_\_  
( Date )

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# Exhibit B

Project Number

Subject

Date

Please do not write in the margin

# "FLUX APPLICATION FOR PROCESSING FLIP CHIP COMPONENTS"

DURING MY LAST TRIP TO JAPAN, IT OCCURRED TO ME THAT IT MAY BE POSSIBLE TO INCORPORATE A PIN TRANSFER PROCESS ON OUR EXISTING DIE ATTACH EQUIPMENT.

## UNITIVE PRE-MEETING

DESIGN GUIDELINES FOR UNITIVE: FCT NEED TO BE REVIEWED - (KOSHMUS)  
PROCESS OVERVIEW

1) INTRODUCTIONS → MICRON ROADMAP

2) UNITIVE PRESENTATION

ORGANIZATION CHANGES / COMPANY STATUS

TECHNOLOGY PRESENTATION

ROADMAP

MANUFACTURING OVERVIEW

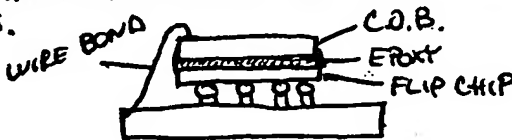
3) QUESTIONNAIRE RESPONSE CLARIFICATIONS

4) QUESTIONS & ANSWER

1 - NO ENTRIES SALE

DUE TO EQUIP. PROCUREMENT

STACKED FLIP CHIP IN PACKAGE. A METHOD FOR STACKING A FLIP CHIP AND A C.O.B. INTO THE SAME PACKAGE. THE FIRST DIE IS FLIP CHIP. EPOXY PASTE IS THEN DISPENSED ONTO THE BACKSIDE OF THE FLIP CHIP. THE C.O.B. DIE IS THEN PLACED (FACE UP) INTO THE EPOXY PASTE. THIS PROCESS IS COMPLETED PRIOR TO SOLDER REFLOW. THE DIE ARE THEN PUT INTO THE SOLDER REFLOW OVEN AT THE SAME TIME WHICH SNAPS CURES THE EPOXY AND REFLUXES THE SOLDER BUMPS.



FOLLOWING POST CURE, THE C.O.B. DIE IS WIRE BONDED TO COMPLETE THE ELECTRICAL CONNECTION.

Author's Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Witness' Signature: \_\_\_\_\_

Date: \_\_\_\_\_

(Read and Understood)